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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/682,900	10/31/2001	William Steven Lanier	59589.000004	2925

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EXAMINER

SODERQUIST, ARLEN

ART UNIT	PAPER NUMBER
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1743

DATE MAILED: 08/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/682,900	Applicant(s) LANIER ET AL.	
	Examiner Arlen Soderquist	Art Unit 1743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19, 21-27 and 29-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19, 21-27 and 29-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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1. Claims 1-24 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: those found in paragraph [0028] bridging pages 8-9 of the instant specification constituting the elements making up the fundamentally different approach to NO_x concentration measurement. These include one or more of an NO₂ converter configured for use on hot wet gas samples that is housed in a heated chamber (above the dew point of the gas samples) adjacent to the stack with a dryer situated downstream of the converter. In other words the structure to convert the NO₂ into NO in a hot wet gas sample prior to water removal is the structure required for the claims to conform to the statement in the specification that the invention uses a fundamentally different approach.

2. Claims 25-34 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: those required including structure and/or step order for the claims to conform to the statement in the specification that the invention uses a fundamentally different approach. See the above paragraph rejecting the apparatus claims for a more complete explanation of the essential elements/steps that are missing. As noted above paragraph [0028] of the instant specification clearly indicates that some requirements need to be met relative to the type of NO₂ converter and the order in which the steps are performed. As the claims now stand there is not a clear order for when the water is removed from the gas sample relative to the NO₂ conversion and there is no limitation on the type of NO₂ converter.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1 and 8-11, 22, 24-25, 27, 29-31 and 33-34 are rejected under 35 U.S.C. 102(b) as being anticipated by applicant's admission of prior art in describing figure 1 of the instant application. In the instant specification applicant describes a prior art device and method in figure 1 and paragraphs [0019] to [0027] which covers the above claims because of the omitted structure and/or step order as discussed above.

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5. Claims 1, 9-11, 22, 24 and 33-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Jacquot (newly cited and applied). In the paper Jacquot discusses quantification testing of an infrared analyzer system for sulfur dioxide and nitric oxide in power plant stack gas. A description is given of a field qualification test carried out to determine application suitability of an analysis sampling system for the measurement of SO₂ and NO in coal-fired power plant stack gas. The qualification test was carried out as a result of operational problems experienced with the original system shown in figure 1. After modification to the system of figure 2, the system was operated for approximately 6 weeks during which time daily comparisons were made between analyzer readings and wet chemical determinations for SO₂ and NO. Overall agreement was >5% on the average (relative to the laboratory results) and >11% at the 95% confidence level. Analyzer stability (drift) was found to average <1% of full scale/day; the 95% confidence level extremes were <5% of full scale/day. The effects of several sample conditioning parameters were evaluated such as adsorption in sample lines and filter; cooling and condensing; interference by water vapor and CO₂. All were found to have an insignificant effect on the analysis within the accuracy observed. The modified sampling-analysis system was suitable as a process monitor for SO₂ and NO in power plant stack gases. The system of figure 2 shows a sampling device positioned and configured to extract a sample from the stack, a filter positioned adjacent to the stack, a heated sampling line providing fluid communication between the sampling device and the filter, a refrigerated condenser for removing water from the sample located adjacent to and downstream of the filter and at least one analyzer in fluid communication with the gas sampling line located down stream of the refrigerated condenser. Relative to the chamber language of the claim, the description on page 2, right column, 7th paragraph teaches that the filter is housed in an electrically heated box that is kept above the sample dew point which would constitute a heated chamber. Relative to the adjacent to language of the claims, the legend for figure 2 indicates that the sample line is electrically heated and insulated for a length of about 50 feet or a length that would have been considered adjacent to or proximate to by one of skill in the art. The device also has means to provide span gases for calibration of the device. Relative to the heating of things such as the sample line, page 9, right column teaches that the types of stainless steel used will resist corrosion by the sample when heated to at least above the sample dew point.

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6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1-5, 8-9, 10-16, 19, 21-27 and 29-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izumi (JP 51-3289) in view of Jacquot as explained above and Matsuda (US 3,977,836) or Burrows (US 5,739,038). In the published application Izumi teaches analysis of nitrogen oxides in waste gases. In figure 1 NO_x in waste gases is oxidized to N₂O₅ and HNO₃, which are then thermally decomposed to NO₂. Then, the amount of NO₂ is directly determined without condensing water vapor in the waste gases by an analysis method such as ESR method. Optionally as shown and described in figure 4 and its associated description, the NO₂ in the waste gases is reduced to NO by an NO₂ converter (31), the amount of which is determined by chemiluminescence (34), IR spectroscopic, or potentiostatic electrolysis methods after removing moisture from the waste gases. The second to last paragraph of page 598 (fourth page of the published application) teaches using molybdenum (Mo) in the NO₂ converter at a temperature of between 350-450 °C to cause the conversion of NO₂ into NO. In figure 1 element 3 is a dust filter and would have a chamber with an interior. Elements 22-25 are heaters. Page 597 teaches maintaining the gas sample at 110 °C ± 5 °C for avoiding water problems. Izumi does not teach that the sample is heated to at least the dew point of the sample, measurement of other gases, a separate analyzer room or addition of a span gas.

In the patent Matsuda teaches method and apparatus for measuring an ammonia concentration of a gas by a process that includes measurement of nitrogen oxides. Element 32 of

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figure 3 is a span gas feeder and is used in the calibration of the instrument (see columns 3-4 and the description of figure 7 in column 7).

In the patent Burrows teaches a spectrometer gas analyzer system to monitor emission of environmental gases such as nitrogen oxides from industrial processes. Column 9, line 48 to column 10, line 9 and column 12, lines 47-63 teach the use of full-scale span calibration of the analyzer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to heat the respective parts of the Izumi device to at least the dew point of the sample to help prevent corrosion as taught by Jacquot. Additionally the Jacquot reference shows that the filter would be housed in some type of box or container that would constitute a chamber. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the span gas device and process as taught by Jacquot, Matsuda or Burrows into the Izumi apparatus and method for their recognized ability to calibrate the measurement process. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the measurement of additional gases and the separate analyzer room as taught by Jacquot into the Izumi apparatus for the ability of further characterizing the exhaust or flue gases as shown by Jacquot.

8. Claims 6-7 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Izumi in view of Jacquot and Matsuda or Burrows as applied to claims 2 and 12 above, and further in view of Yamaki (US 4,073,866). Izumi does not teach a carbon and molybdenum combination as the surface for converting the gas to NO.

In the patent Yamaki teaches a process for converting nitrogen dioxide into nitrogen monoxide in which a gas a gas containing nitrogen dioxide is brought into contact at a temperature ranging from 50 °C to 400 °C with a carbide of a metal selected from the group consisting of chromium, molybdenum, tungsten, vanadium, titanium, tantalum, silicon and boron or a composite carbide of such metals, thereby reducing nitrogen dioxide contained in the gas to nitrogen monoxide. In the background section of column 1 Yamaki teaches that measurement of nitrogen oxides in an analyzer utilizing chemiluminescence is known. By the use of this analyzer, the concentration of nitrogen monoxide contained in environmental atmosphere or exhaust from apparatus can be measured precisely. For analysis of nitrogen dioxide, however,

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the analyzer necessitates the use of a converter capable of converting nitrogen dioxide into nitrogen monoxide. In the converter, carbon or a mixture of molybdenum oxide and carbon is used as reducing agent. However, a converter utilizing this reducing agent has as a drawback that it is effective only at high temperatures within a narrow range from 350 °C to 450 °C and these conditions apparently fail to make the conversion process efficient. Furthermore, there is an additional drawback that since the reducing agent used in this converter is influenced within such high temperature range by organonitrogen compounds such as peroxyacetyl nitrate and alkyl nitrates, it is impossible in the presence of such compounds to selectively and quantitatively convert nitrogen dioxide alone into nitrogen monoxide. The carbides of Yamaki are taught as being able to cause the selective conversion of nitrogen dioxide at a lower temperature. The tables and examples teach that the molybdenum carbide is capable of efficiently converting nitrogen dioxide to nitrogen monoxide.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the molybdenum carbide of Yamaki into the device and method of Izumi because of the ability to reduce the conversion temperature and efficiency as taught by Yamaki.

9. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. Paragraph [0028], bridging pages 8-9 of the instant specification sets forth requirements that set the instant inventions fundamentally different approach apart from the described prior art. These features are required for the instant claims to define over the described prior art as some of the claims do not require a converter that is capable of being used on hot wet gases. It should also be pointed out that the dew point of a gas is dependent upon the amount of moisture in the gas. Paragraph [0036] of the instant specification shows that dew points of 5 °C are possible. Relative to the applied art, examiner points out that the use of the term adjacent does not set definite limits on the distance between the features not does it exclude features between two things. Also the claims are open language, which does not exclude features being located two recited elements that are required to be adjacent as in the claims. Relative to the method claims, the relative order of the steps is not clearly established and in some cases the removal of water can be placed before the conversion of NO₂ (see claims 25 and 33). Thus art that removes water prior to NO₂ conversion is still within the instant claim

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scope. It also should be apparent from the Jacquot reference that a filter would have some sort of box or housing that is clearly within the definition of a chamber. In other words applicant's use of the word chamber in the claims does not define over the box or a similar housing used by Jacquot, Izumi or the admitted prior art.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additionally cited art relates to measurement of stack or flue gases from industrial processes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arlen Soderquist whose current telephone number is (571) 272-1265 as a result of the examiner moving to the new USPTO location. The examiner's schedule is variable between the hours of about 5:30 AM to about 5:00 PM on Monday through Thursday and alternate Fridays.

A general phone number for the organization to which this application is assigned is (571) 272-1700. The fax phone number to file official papers for this application or proceeding is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



August 5, 2004
ARLEN SODERQUIST
PRIMARY EXAMINER